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Indian Standard

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सुरक्षा, रक्षात्मक तथा वृत्तिक जूते के चयन, देखभाल और मरम्मत के लिए अभ्यास का कोड

(पहला पुनरीक्षण)

Code of Practice for Selection, Care and Repair of Safety, Protective and Occupational Footwear

(First Revision)

ICS 13.340.50

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Footwear Sectional Committee, CHD 19

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

There is a vast change in the field of footwear manufacturing and with advanced technological developments many new concepts have come in and many more are to come. In this revision, the scope of the standard has been extended to include protective and occupational footwear along with safety footwear. Additionally, a guide on different footwear products to be appropriately used for relevant purposes is provided.

Safety/protective and occupational footwear are generally used by concerned workforce for day to day activities in their respective professions, as suited to their pattern of work and required safety/protection as per the nature of work. Improper selection, care and maintenance of these footwear causes discomfort and makes them unserviceable after some time and fail to serve the special purpose for which they are made. Hence, this standard is prepared to provide a suitable guide to users for selection, maintenance and repair of these footwear.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

Indian Standard

CODE OF PREACTICE FOR SELECTION, CARE AND REPAIR OF SAFETY, PROTECTIVE AND OCCUPATIONAL FOOTWEAR

(First Revision)

1 SCOPE

This standard prescribes a code for selection, care and repair of safety/protective and occupational footwear.

NOTE — The repair procedures suggested are suitable for footwear having leather upper and sole and leather or moulded rubber/polymer/elastomer heel. The procedures are however not applicable for footwear with textile upper or footwear with polymeric/elastomeric/rubber upper.

2 REFERENCES

The standards listed in Annex A contain provisions which though reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards, listed in Annex A.

3 TERMINOLOGY

3.1 For the purpose of this standard, definitions given in IS 2050 and the following shall apply.

3.2 Classifications — Non leather/leather upper footwear is to be classified as class (I) vide clause 4 of IS 15298 (Part 2), (Part 3) and (Part 4). Non leather category may include textile, synthetic leather etc.

All polymer/elastomer/rubber upper footwear is to be classified as class (II) vide clause **4** of IS 15298 (Part 2), (Part 3) and (Part 4).

3.3 Compact Outsole/Heel — Suitable polymer/rubber/elastomer having density not less than 0.9 gm/cm^3.

3.4 Compact Insole and Insocks — Textile coated with suitable rubber/polymer/elastomer having density not less than 0.9 gm/cm^3.

3.5 Elastomer — All types of blended polymers (TPO, TPR), grafted polymer, co-polymer etc. which exhibit rubber like property and thermo form/set and used for production of footwear.

3.6 Occupational Footwear for Professional Use — Footwear incorporating features suitable for operation in general condition (wet condition of minimal impact) and in rain, in day to day use in related working areas so as to protect the feet.

3.7 Polymer — Polymeric materials are as per definition vide clause **3.4** of IS 15298 (Part 2), (Part 3) and (Part 4) and as defined under harmonized system of nomenclature (HSN) as a good to fall under chapter head of 39.

3.8 Protective Footwear for Professional Use — Footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in the working sectors. For such purposes the footwear is designed to give protection against impact when tested at a minimum energy level of 100 J and compression at a load of minimum 10 kN.

3.9 Protective Toe Cap — Component of footwear designed to protect the toes of the wearer from impacts up to an energy level of at least 100 J and compression load of at least 10 kN.

3.10 Rubber — Rubber materials are as per definition vide clause **3.3** of IS 15298 (Part 2), (Part 3) and (Part 4) and as defined under harmonized system of nomenclature (HSN) as a good to fall under chapter head of 40.

3.11 Safety Footwear for Professional Use — Footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in heavy industrial areas for which the footwear was designed to give protection against impact when tested at an energy level of at least 200 J and compression at a load of at least 15 kN.

3.12 Safety Toe Cap — Footwear component built into the footwear designed to protect the toes of the wearer from impacts up to an energy level of at least 200 J and compression at a load of at least 15 kN.

4 SELECTION

4.1 All types of footwear are available in different sizes and fittings. Details of sizes and fittings are given in IS 1638 and each person should be provided with footwear of proper size and fittings.

4.2 Foot measuring devices should be used, a simple form of a device is shown in Fig. 1. In cases where no foot measuring device is available, the measurement of width and length of the foot should be taken by the shoe measuring tape with the weight of the body falling on both the feet uniformly.

4.3 Girth measurement of the joints should also be taken with the help of a measuring tape while standing, when the foot is under normal pressure of the body.

4.4 After ascertaining the size and fitting, footwear should be tried on the feet of the user to ensure proper fit and comfort. Only properly fitted footwear should be issued to individual worker.

5 CARE

5.1 Cleaning and Dressing

5.1.1 *Personal*

Footwear should always be kept as clean as possible. After every wear if the footwear are soiled with mud and dirt, they should be cleaned with soap and dried. Cold soapy water generally removes most of the dirt. Footwear with russet, retanned or similar leather upper should be treated with animal or vegetable oils, grease or shoe compound oils at least once a week to help preserving the quality of the leather and to render the leather more water repellent, soft and pliable.

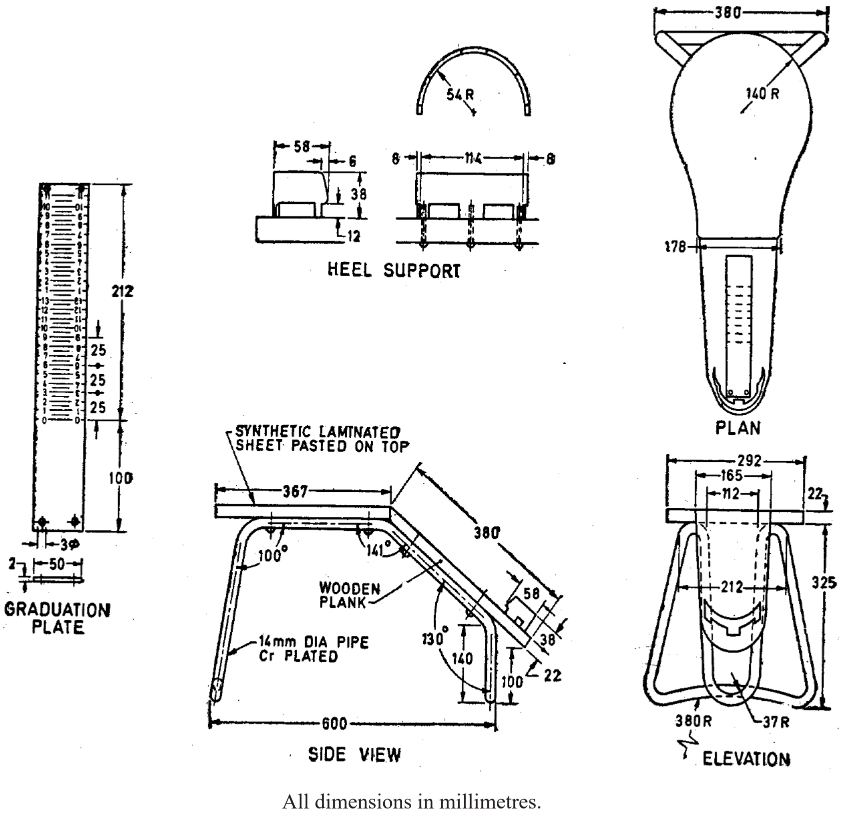
Textile or rubber/polymer/elastomeric upper footwear should be cleaned by damp cloth every day after use to remove adhering dirt.

Footwear with leather upper should be regularly cleaned and polished with shoe polish.

5.1.2 *Institutional*

A suitable revolving brushing device shown in Fig. 2 should be used for proper cleaning of the footwear. At the end of every shift or after every use, the footwear should first be put to the first brush (cylindro-conical in shape) of the device, to clean out all the dirt. Then the footwear should be placed on the second brush (which is cylindrical in shape) for drying.

5.1.2.1 For cleaning the footwear with textile upper a small water spray arrangement may be provided near the brushing machines so that the boots could be drenched in water and cleaned by the first brush. The boot should then be presented to the second brush where the boots may be dried. Wherever possible, an



All dimensions in millimetres.

FIG. 1 SHOE FITTER'S TABLE

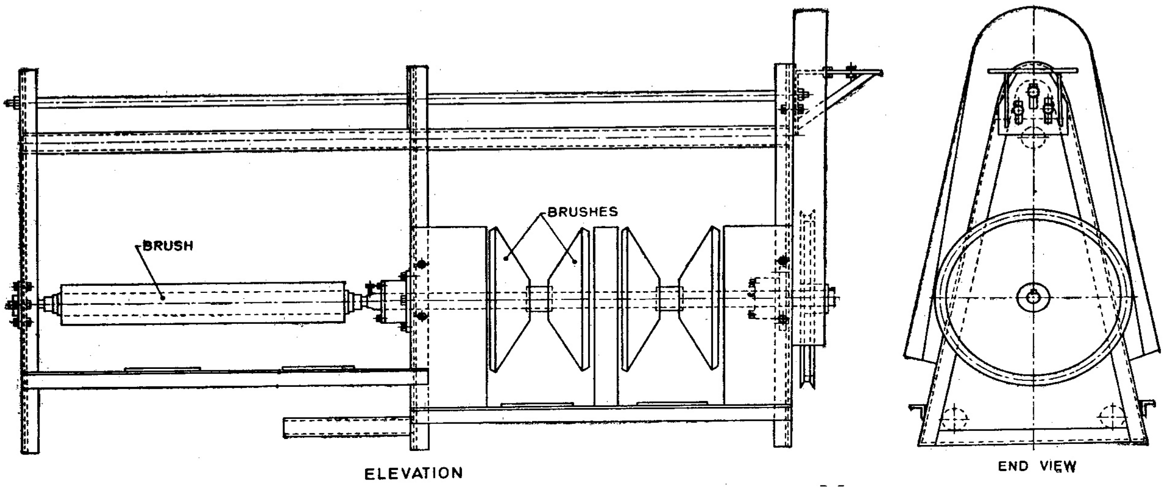


FIG. 2 SCHEMATIC DIAGRAM OF BOOT-POLISHING MACHINE

air jet should be provided after the second brush under which the boots could be thoroughly dried. The air jet should be operated from a compressor.

5.2 Preservation of Leather

Leather, especially upper, shall be preserved well and rendered more water repellent by treating them with castor oil, soyabean oil, shoe dubbin or neat's foot oil. Leather absorbs castor oil, soyabean oil slowly, so the footwear should be left overnight before it is reworn. Heavy coating should always be avoided. Frequent rubbing with light coat of the above treatment should be preferred.

5.2.1 *Preservation of Sole Leather*

This may also be made more water repellent by treating them with a mixture of the following composition:

Suitable mineral oils (free from lubricating additives commonly added for motor oils)	4 parts
Beeswax (conforming to IS 1504)	1 part
Paraffin wax	1 part
Rosin (conforming to IS 553)	½ part

The mixture should be not enough for the hand to touch. Footwear should be placed in the mixture for 15 min in such a way that the entire leather sole from outside goes inside the mixture. The mixture should also be rubbed on upper leather and cleaned.

5.2.1.1 Alternatively, the following preparations of dubbin may be used for preservation of upper leather:

a) Beeswax (conforming to IS 1504)	25 parts
Castor oil (conforming to IS 435)	75 parts
Phenol (as a preservative)	1 part
b) Tallow	75 parts
Cottonseed, neem or pungum oil	25 parts

5.3 Drying of Footwear

Footwear are liable to become wet from various sources, mainly foot perspiration, water in the mines and rain-water. They are to be dried properly before use. Footwear should never be dried under direct heat. It would reduce the life of the footwear. Such drying under direct heat will turn the footwear stiff and uncomfortable.

5.3.1 To avoid undue deformity in shape during drying, the footwear should always be dried with a shoe-tree on. In the event of shoe trees not being available the footwear should be stuffed with crumpled newspaper. The stuffing should be done in such a way that there is no room left for upper leather to shrink due to loose stuffing. This practice would help the footwear to retain its shape and would also absorb the moisture from inside. The counters, toes, and the heel of the footwear if deformed by water or moisture, should be brought as near as possible to the original shape.

6 REPAIR

6.0 General

Repair to any damaged or worn out component should be made immediately in order to obtain the maximum amount of service from the footwear, because the longer they are neglected the more difficult it becomes to repair them properly. Neglect to keep the sole in good condition especially at toe and heel shall lower the safety factor of the footwear. Prior to undertaking any repair, the footwear should be examined by a competent examiner and a decision made, based on the defects as to whether it is repairable.

Some of the defects are given below:

Defect	*Repairable*	
	Yes	No
Worn out, thin or cracked outsoles i) When leather ii) When non leather	√	√
Missing or badly worn heel i) When leather ii) When non-leather	√	√
Loose or torn welt		√
Damaged shank		√
Upper stitching ripped	√	
Missing or damaged eyelets	√	
Broken or loose sole stitches	√	
Worn or cracked quarter linings at back of shoe		√
Insocks with slightly uneven, 'lumpy' or curled edges	√	
Badly cracked and holed uppers		√
Torn or missing tongues in, ankle boots	√	
Leather sole with steel attachment at		
i) heel (leather)	√	
ii) toe (leather)	√	
iii) tip (leather)	√	

All material to be used for repairing should conform to the original requirements prescribed in the relevant standard.

6.1 Repair of Leather Sole

6.1.1 Prior to carrying out repairs to the leather outer sole, the correct size of last on which the footwear was made, should be inserted into the footwear. The last should not be removed until the edge setting and finishing operations are completed.

6.1.2 Leather half soles and heels should never be used in dry condition and should be mellowed before use. This should be done, by soaking the leather for half an hour on the day previous to use. After soaking the leather should be allowed to drain for about ten minutes, wrapped in moist gunny bags and kept in a cool place. The following day, the sole and heels should be placed grain to grain and should be hammered in pairs starting from the centre and working round to the outside edges. This operation reduces the substance slightly but helps in the following respects:

a) It makes the leather easier to work.

b) It permits the new sole and heel to be bedded down without violent hammering. The leather will be more wet resisting. The pores and fibers are tightened and water is therefore not so readily absorbed.

c) Considerably longer wear results.

6.1.3 When removing the worn leather out sole sufficient care should be taken to ensure that no damage is done to the foundation of the footwear. Studs etc should first be removed and then the stitches round the fore part carefully cut. The screws should be cut out after removing the soles without hammering down. The screws should be cut off close to the remaining sole. The worn out sole should then be stripped or pulled away from the footwear from the toe up to the joint and cut off 30 mm behind the joint. Half sole should be executed with a straight graft. The new half sole should never be countersunk. Countersinking new half sole would considerably weaken the footwear waist.

As such this practice should be avoided. The graft or the joint of old and new half sole should be made by skiving with the edges at the same angle to make the splice not less than 35 mm wide from the joint. The thinner part of the new sole should be skived down to 3 mm. After preparation of the graft the half sole should be attached at the waist first by 15-mm rivets which should be placed 5 mm away from the edge. The rivets should be placed 6 mm apart. The sole should then be slicked forward and mounted at the bottom of the footwear and then temporarily attached by 2 rivets at the toe. The extended edges of the new sole should then be trimmed all round the edges of the middle sole. Riveting round the fore part should then be done and the rivets should be driven slightly at an angle which should be placed 10 mm away from the outside edge and not more than 12 mm apart. The sole edge should then finally be trimmed and should be rasped to conform to the shape of the boot and finally smoothed with a blunt knife.

6.2 Repair of Leather or Moulded Rubber/Polymer/ Elastomer Heel

6.2.1 The heel being the portion which wears out most frequently. It should always be kept flat and worn out portions should be repaired. The worn out heel not only causes the foot out of balance causing undue strain on the footwear, the foot muscles and the arches but actually endangers the wearer by improper body balance.

6.2.2 Worn out lifts on the heel should be removed first so that the heel should be rebuilt again by attaching the lifts successively. The nails or heel pins sticking out after removing the lifts should not be hammered down. Those should be cut off close to the remaining lifts of the heel.

6.2.3 In case the footwear require a new heel, heels should be solidly built up. Care should be taken to see that the heels are kept to the original height otherwise the pitch of the footwear will be destroyed, In case of footwear requiring replacement of only the top piece, a solid top piece should be used. After having attached the top piece, the extended portion of the leather should be removed and the edges finished in the same manner as done in case of soles.

6.3 Repair of Leather Upper

6.3.1 Missing and loose eyelets should be replaced and care should be taken that the newly fitted eyelets are properly clenched.

6.3.2 Care should be taken to repair any break in upper seams. Back straps requiring repair should first have the back seams re-stitched, if necessary. Tears or bad cracks in uppers should be patched up at an early stage and tongues replaced as soon as necessary.

6.4 Minor Repair

Small or similar damages in the upper should be repaired at an early stage before they develop into major defects. All patches used for the job should be skived on the edges before being attached. Suitable threads as required should be used.

7 PROPERTIES OF RUBBER/PVC/PU

For selection of suitable rubber/PVC/PU as material for manufacture of safety/protective/occupational footwear, some important physical properties are given in Table 1.

8 SELECTION OF FOOTWEAR FOR RELEVANT PURPOSES

It is important to select the right footwear for the right activity. For example, a worker in a heavy industry should select footwear which ensures safety of his feet. Whereas, school children should wear footwear which should be covered as well as light to ensure comfort of the children all day. Keeping this in mind, the Table 2 provides information on proper selection of footwear for different purposes.

Table 1 Some Inportant Physical Properties of Rubber, PVC and PU

(*Clause* 7)

Sl No.	Properties	Nitrile Rubber	SBR[1] Rubber	Isobutylene-Isoprene Rubber	Polychloroprene Rubber	Natural[2] Rubber	Silicone Rubber	Plasticized PVC	Polyurethane	Chlorosulphonated Polyethylene (CSM)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Scuff resistance	P	P	GE	GE	P	E	E	E	G
ii)	Weather resistance	F	F	GE	E	F	E	E	E	E
iii)	Heat resistance	G	FG	GE	G	F	E	F[3] and [4]	F	G
iv)	Chemical resistance	FG	FG	E	FG	FG	GE	E	P	G
v)	Oil resistance	E	P	P	FG	P	PG	GE[5]	E	G
vi)	Impermeability	G	F	E	G	F	P	E	G	G
vii)	Cold resistance	G	G	G	FG	G	E	G[6]	G	F
viii)	Tear resistance	FG	FG	G	FG	GE	P	G	E	F
ix)	Abrasion resistance	G	G	FG	G	E	P	E	E	F
x)	Set resistance	GE	G	FG	F	G	GE	F	G	FG
xi)	Dynamic properties	GE	G	F	F	E	P	E	E	G
xii)	Acid resistance	F	F	G	FG	FG	FG	E	P	G
xiii)	Tensile strength	GE	GE	G	G	E	P	GE[3]	EG	GG
xiv)	Electrical properties	F	G	G	F	G	E	E	FG	FG
xv)	Water/steam resistance	FG	FG	G	F	FG	F	G/P[3]	P	G
xvi)	Flame resistance	P	P	P	G	P	G	E[7]	P	G
	Service temperature range (ºC)	– 54 to + 121	– 50 to + 60	– 54 to + 107	– 40 to + 120	– 60 to + 60	– 93 to + 232	– 40 to + 40	– 20 to + 80	– 20 to + 140

Code:

P = Poor

F = Fair

G = Good

E = Excellent

Source:

1 Swastik Rubber Products, Pune

2 Calico Chemicals, Bombay

NOTE — The above properties serve only as a guide and are applicable for only properly compounded and vulcanized rubber.

[1] See IS 5189 : 1985.

[2] See IS 4588 : 1986.

[3] Specification limits for these characteristics have been stipulated in IS 9766 : 1992.

[4] Not recommended above 50 ºC continuous works.

[5] When specifically compounded.

[6] May be good when so compounded.

[7] When specially compounded.

Table 2 Selection of Footwear According to Purpose

(*Clause* 8)

IS No.	Nature of Footwear	Relevant Purpose
IS 1989	Protective and Safety	Heavy industrial and mining use not fit for use in wet condition but fit for use in prone to hot contact areas
IS 3735	Occupational	For physical training, uniform, day to day routine work etc. in dry bound areas and rough terrain
IS 3736	-do-	-do-
IS 3738	-do-	Relevant work in wet, slurry, waterlogged areas or prone to hot contact areas. To prevent snake bite, leech and similar hazards
IS 3976	Protective and Safety	For mining and industrial use in dry and slurry areas as per type and variety. Also fit for use in hot contact condition.
IS 5557	-do-	Heavy industrial and mining use in wet, slurry, waterlogged areas or prone to hot contact areas.
IS 7568	Occupational	For physical training, uniform, day to day routine work etc. in dry bound areas and rough terrain
IS 11226	Protective and Safety	Heavy industrial and mining use not fit for use in wet condition but fit for use in prone to hot contact areas
IS 12254	-do-	Heavy industrial and mining use in wet, slurry, waterlogged areas but not fit for hot contact areas
IS 13292	Occupational	Relevant work in wet, slurry, waterlogged areas but not prone to hot contact areas
IS 14544	Protective and Safety	Heavy industrial and mining use not fit for use in wet condition but fit for use in prone to hot contact areas
IS 15298 (Part 2)	Safety	Covers requirements of all shoes for heavy industrial and mining use
IS 15298 (Part 3)	Protective	Covers requirements of all shoes for industrial and mining use
IS 15298 (Part 4)	Occupational	Covers requirements of all shoes meant for day to day occupational wear
Shoes for Municipal Work	-do-	Relevant work in dry and also in wet condition for scavenging work
PVC/PU Shoes	-do-	Relevant day to day routine work

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
435 : 1973	Castor oil
553 : 1984	Rosin (gum rosin)
1504 : 1996	Sizes and fitting of footwear
1638 : 1969	Sizes and fitting of footwear
1989 (Part 1) : 1986	Leather safety boots and shoes: Part 1 For miners
1989 (Part 2) : 1986	Leather safety boots and shoes: Part 2 For heavy metal industries
2050 : 1991	Glossary of terms relating to footwear
3735 : 1996	Canvas shoes, rubber sole
3736 : 1995	Canvas boots, rubber sole
3738 : 2004	Rubber boots
3976 : 2003	Protective rubber canvas boots for miners
4588 : 1986	Rubber, raw, natural (*third revision*)
5189 : 1985	Cold polymerized raw styrene-butadiene rubber (*first revision*)
5557 : 2004	Industrial and protective rubber knee and ankle boots
9766 : 1992	Flexible PVC compounds (*first revision*)
11226 : 1993	Leather safety footwear having direct moulded rubber sole
12254 : 1993	Polyvinyl chloride (PVC) industrial boots
12649 : 1989	Treated/coated fabrics for various applications — Guide for selection
13893 : 1994	Polyurethane soles semirigid
14544 : 1998	Leather safety footwear with direct moulded PVC soles
15298 (Part 2) : 2015	Personal protective equipment: Part 1 Test methods for footwear (*second revision*)
15298 (Part 3) : 2011	Personal protective equipment: Part 1 Test methods for footwear (*second revision*)
15298 (Part 4) : 2010	Personal protective equipment: Part 4 Occuptional footwear

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Footwear Sectional Committee, CHD 19

Organization	*Representative(s)*
In Personal Capacity Former Chief Scientist, CSIR-CLRI (*Flat F1, Bhoopathy Apartment, 10, Ethiraj Street, Palipattu, Chennai – 600113*)	Dr B. N. Das (***Chairman***)
Ambuja Cements, Mumbai	Shri Piyush B. Jain
Atharva Labs, Noida	Ms Aparna Parvatikar Shri V. B. Parvatikar (*Alternate*)
Arvind Footwear Pvt Ltd, Ahmednagar	Shri Dilip Borkar
BASF Polyurethanes India Ltd, Mumbai	Shri Alok Goel Shri Jitender Kumar (*Alternate*)
Bihar Rubber Co Ltd, Ranchi	Shri Jayanta Kumar Lahiri
Border Security Force, New Delhi	Shri K. L. Shah Ms Prem Vishwas (*Alternate*)
Bureau of Police Research and Development, New Delhi	Shri Jagir Chand
Central Footwear Training Institute, Agra	Shri Sanatan Sahoo Shri S. K. Bhatia (*Alternate*)
Central Institute of Mining and Fuel Research, Dhanbad	Dr J. K. Pandey
Central Leather Research Institute, Chennai	Dr R. Mohan Shri Sathya Raj (*Alternate*)
Central Reserve Police Force, New Delhi	Shri Randhir Kumar Jha Shri R. K. Thakur (*Alternate*)
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Director General of Factory Advice Service & Labour Institute, Mumbai	Dr Brij Mohan Shrimati M. K. Mandre (*Alternate*)
Footwear Design and Development Institute, Noida	Shri Shailender Saxena Shri Saroj Kumar Panda (*Alternate*)
Liberty Shoes Pvt Ltd, Karnal	Shri Adesh Gupta Shri S. S. Lahiri (*Alternate*)
Mangla Plastics	Shri J. Basak
MSME – Technology Development Centre, Meerut	Shri Aditya Prakash Sharma
Prolific Engineers	Shri G. P. Kedia
XO Footwear, Delhi	Shri Nalin Gupta Shri Manoj Kumar (*Alternate*)
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Kumari Kreeti Das
Scientist 'B' (CHD), BIS

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Amendments Issued Since Publication

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